CLAIMS

WHAT IS CLAIMED IS:

1. An apparatus for expression and capture of biomolecules comprising:
   a. at least one reaction vessel defining a reaction space;
   b. an expression system housed within the reaction space, wherein the expression system expresses a first biomolecule; and,
   c. a solid support having an adsorbent surface that binds the first biomolecule wherein the solid support is in fluid communication with the reaction space.

2. The apparatus of claim 1, wherein the expression system comprises a cell-free system.

3. The apparatus of claim 1, wherein the expression system comprises a cell-based system.

4. The apparatus of claim 1, wherein the expression system comprises both a cell-free system and a cell-based system.

5. The apparatus of claim 1, wherein the expression system expresses at least a second biomolecule.

6. The apparatus of claim 1, wherein the first biomolecule comprises a capture moiety that binds to the adsorbent surface.

7. The apparatus of claim 1, wherein the first biomolecule comprises a detectable moiety.

8. The apparatus of claim 1, wherein the apparatus comprises a plurality of reaction vessels.

9. The apparatus of claim 1, wherein the solid support is not an integral part of the reaction vessel.

10. The apparatus of claim 9, wherein beads comprise the solid support.

11. The apparatus of claim 1, wherein the solid support comprises a hydrogel.

12. The apparatus of claim 1, wherein the adsorbent surface comprises a specific binding reagent selected from the group consisting of: an antibody, a receptor, an antigen and a ligand.

13. The apparatus of claim 1, wherein the solid support is an integral part of the reaction vessel.

14. The apparatus of claim 13, wherein the solid support is comprised within a biochip.

15. The apparatus of claim 14, wherein the apparatus comprises a plurality of reaction vessels and the biochip comprises a plurality of addressable locations comprising an adsorbent surface in fluid communication with a plurality of reaction spaces.

16. The apparatus of claim 14, wherein the biochip is an MS probe.

17. The apparatus of claim 16, wherein the MS probe is a SEAC probe.

18. The apparatus of claim 16, wherein the MS probe is a SEAC/SEND probe.

19. The apparatus of claim 15, wherein the biochip is an MS probe.

20. The apparatus of claim 19, wherein the MS probe is a SEAC probe.

21. The apparatus of claim 19, wherein the MS probe is a SEAC/SEND probe.

22. The apparatus of claim 13, wherein the reaction vessel is comprised within a multi-well microtiter plate and the solid support is comprised within a wall and/or floor of each well.

23. The apparatus of claim 22 wherein the wells of the microtiter plate comprise closed bottoms.

24. The apparatus of claim 22 wherein the microtiter plate is a filter plate.

25. A system for detecting a biomolecule comprising:

a. an apparatus comprising:

i. at least one reaction vessel defining a reaction space;

ii. an expression system housed within the reaction space wherein the expression system expresses a first biomolecule;

iii. a solid support having an adsorbent surface that binds the first biomolecule wherein the solid support is in fluid communication with the reaction space; and,

b. a detector comprising means for detecting a molecule immobilized on the adsorbent surface.

26. The system of claim 25, wherein the means for detecting comprises a mass spectrometer that detects mass-to-charge ratio of the molecule.

27. The system of claim 25, wherein the molecule is fluorescently labeled and the detector comprises a fluorimeter.

28. The system of claim 25, wherein the detector comprises means for detecting a parameter selected from the group consisting of absorbance, reflectance, transmittance, birefringence, refractive index, and diffraction.

29. The system of claim 25, wherein the means for detecting is selected from the group consisting of surface plasmon resonance, ellipsometry, resonant mirror techniques, grating coupled waveguide techniques and multipolar resonance spectroscopy.

30. The system of claim 25, wherein the expression system is a cell-based expression system and wherein the system further comprises a sonicating device.

31. A method for expressing and capturing a biomolecule, comprising:

a. providing an apparatus comprising:

i. at least one reaction vessel defining a reaction space; and

ii. a solid support having an adsorbent surface that binds a first biomolecule wherein the solid support is in fluid communication with the reaction space;

b. providing in the reaction space an expression system that expresses the first biomolecule;

c. expressing the first biomolecule within the reaction space; and,

d. capturing the first biomolecule on the adsorbent surface.

32. The method of claim 31, wherein the expression system comprises a cell-free system.

33. The method of claim 31, wherein the expression system comprises a cell-based system.

34. The method of claim 33, further comprising disrupting the cells of the expression system after expressing the first biomolecule.

35. The method of claim 30, wherein the expression system comprises both a cell-free system and a cell-based system.

36. The method of claim 31, further comprising:

e. detecting the captured first biomolecule.

37. The method of claim 31, further comprising:

e. eluting the captured first biomolecule from the adsorbent surface.

38. The method of claim 31, wherein the first biomolecule has enzymatic activity, and wherein the method further comprises:

e. contacting the captured first biomolecule with a second biomolecule; and

f. detecting evidence of enzymatic activity on the second biomolecule.

39. The method of claim 38 wherein the enzymatic activity is selected from the group consisting of kinase activity, phosphatase activity, glycosylating activity, deglycosylating activity, lipidase activity, delipidase acitivty, transcriptase activity, DNAase activity, RNAase activity and protease activity.

40. The method of claim 31, wherein the first biomolecule has enzymatic activity, and wherein the method further comprises:

e. contacting the captured first biomolecule with a plurality of second biomolecules; and

f. detecting evidence of enzymatic activity on a plurality of second biomolecules.

41. The method of claim 40 wherein the enzymatic activity is selected from the group consisting of kinase activity, phosphatase activity, glycosylating activity,

deglycosylating activity, lipidase activity, delipidase acitivty, transcriptase activity, DNAase activity, RNAase activity and protease activity.

42. The method of claim 31, wherein the first biomolecule has enzymatic activity, and wherein the method further comprises:

e. contacting the captured first biomolecule with an enzymic substrate of the first biomolecule;

f. contacting the first biomolecule with a plurality of test compounds; and

g. detecting evidence of enzymatic activity on the enzymatic substrate.

43. The method of claim 42 wherein the enzymatic activity is selected from the group consisting of kinase activity, phosphatase activity, glycosylating activity, deglycosylating activity, lipidase activity, delipidase acitivty, transcriptase activity, DNAase activity, RNAase activity and protease activity.

44. The method of claim 31, further comprising:

e. contacting the captured first biomolecule with a second biomolecule; and

f. detecting evidence of binding between the first biomolecule and the second biomolecule.

45. The method of claim 44 wherein the first biomolecule is selected from the group consisting of soluble receptors, membrane bound receptors and antibodies.

46. The method of claim 44 wherein the expression system expresses the second biomolecule.

47. The method of claim 31, further comprising:

e. contacting the captured first biomolecule with a plurality of second biomolecules; and

f. detecting evidence of binding between the first biomolecule and any of the second biomolecules.

48. The method of claim 47 wherein the first biomolecule is selected from the group consisting of soluble receptors, membrane bound receptors and antibodies.

49. The method of claim 47 wherein the expression system expresses the plurality of second biomolecules.

50. The method of claim 31, further comprising:

e. contacting the captured first biomolecule with a binding partner capable of forming a comlex with the first biomolecule;

f. contacting the first biomolecule with a test agent; and

g. detecting evidence of modulation of complex formation between the first biomolecule and the binding parther.

51. The method of claim 50 wherein the first biomolecule is selected from the group consisting of soluble receptors, membrane bound receptors and antibodies.

52. The method of any of claims 32 to 51 wherein detecting comprises fluorescence detection.

53. The method of any of claims 32 to 51 wherein detecting comprises fluorescence detection.

54. The method of any of claims 32 to 51 wherein the solid support is comprised within a biochip that is an integral part of the reaction vessel and is detachable from the reaction vessel.

55. The method of claim 54, wherein the apparatus comprises a plurality of reaction vessels and the biochip comprises a plurality of addressable locations, each addressable location having an adsorbent surface in fluid communication with a different reaction space.

56. The method of claim 54, wherein the biochip is an MS probe.

57. The method of claim 31, wherein the first biomolecule comprises a capture moiety that binds to the adsorbent surface.

58. The method of claim 31, wherein the first biomolecule comprises a detectable moiety.

59. A kit for the expression and capture of biomolecules comprising:

a. an apparatus including:

i. a chamber for housing an expression system for a biomolecule; and,

ii. a solid support having an adsorbent surface that specifically

binds the biomolecule wherein the solid support is in fluid communication with the chamber; and,

b. instructions for the use of the apparatus and buffer system in expressing and capturing the biomolecule.

60. The kit of claim 59, further comprising:

c. a wash solution for washing the adsorbent surface.

61. The kit of claim 59 wherein the wash solution comprises an ionic interaction modifier, a pH mofifier, a water structure modifier, a hydrophobic interaction modifier, a chaotropic reagent or an affinity interaction displacer.

62. The kit of claim 59, further comprising:

c. an expression system for expressing the biomolecule.

63. The kit of claim 59, further comprising:

c. an expression system for expressing a plurality of biomolecules.

64. The kit of claim 59, wherein the first biomolecule is an enzyme, and the kit further comprises:

c. a substrate of the enzyme.

65. The kit of claim 59, comprising a biochip that comprises the solid support and wherein the biochip is an integral part of the reaction vessel and is detachable from the reaction vessel.

66. The kit of claim 65, wherein the apparatus comprises a plurality of reaction vessels and the biochip comprises a plurality of addressable locations comprising an adsorbent surface in communication with a plurality of reaction spaces.

67. The kit of claim 65, wherein the biochip is an MS probe.

68. A method comprising:

a. providing a learning set comprising a plurality of data objects representing expression/capture experiments, wherein the experiments are classified into a plurality of different classes based on type of expression system and wherein each data object comprises data representing specific

measurement of a plurality of polypeptides from each experiment captured according to the method of claim 31; and

b. training a learning algorithm with the learning set, thereby generating a classification model, wherein the classification model classifies a data object according to expression system type.